

## The Heath Sand-skipper *Antipodia chaostola* (Meyrick, 1888) (Lepidoptera: HesperIIDae) in Central Gippsland, Victoria

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### Abstract

Specimens of the Heath Sand-skipper butterfly *Antipodia chaostola* were found from only three locations in a survey in Central Gippsland in 1998. The preferred larval food plant, Thatch Saw-sedge *Gahnia radula*, is common and widespread but the butterfly appears restricted to areas of Heathy Woodland, which is a very uncommon vegetation community generally occurring on gentle, north-facing lower slopes. The dominant eucalypt species are stringybarks and peppermints, which commonly are stunted and sparse due to the very infertile, yellowish, gradational soils. Female Heath Sand-skippers appear to favour small young plants or regrowth of Saw-sedge, following bushfires, for oviposition. As fire may be important or necessary for new growth of Saw-sedge, it consequently may be important or necessary for the persistence of the Heath Sand-skipper. Using a 9–12 year fuel reduction burn cycle, and staggering the burning of patches of the habitat in a mosaic pattern, seem necessary to provide a constant availability of appropriate habitat for the Heath Sand-skipper. (*The Victorian Naturalist* 126 (6), 2009, 192–202)

**Keywords:** Thatch Saw-sedge, *Gahnia radula*, habitat, Heathy Woodland, bushfire

### Introduction

The Heath Sand-skipper *Antipodia chaostola* is a medium-sized skipper, with a wingspan of approximately 30 mm for males and 35 mm for females (Fig. 1). As it is fast flying and dull coloured, it is inconspicuous in flight. It is distinguished from its congeners by its orange-brown colour, and differs from hesperilline and other trapezitine skippers by the presence of scattered orange hindwing maculation, and in behaviour by a more open-winged pose when resting in sunshine (Atkins 1984). Larvae are unlikely to be confused with other butterfly species exploiting the same food plant as they have an unusual habit of positioning head down in a downward opening shelter, and have an unusual bright red prothorax (Grund 1988). Braby *et al.* (1997) coined the common name Heath Sand-skipper to replace the previously accepted *Chaostola* Skipper.

*Antipodia chaostola* is an uncommon or rare species throughout its geographical range (Braby 2000; Douglas 1993; Dunn *et al.* 1994; Field 1995; Neyland 1994). Sands (1990) regarded the species as endangered and included it in a category he defined as 'generally widely distributed but decreasing in abundance to the point where their survival is threatened'. It has not been listed

or nominated for listing as threatened under the *Fauna and Flora Guarantee Act* in Victoria, although Crosby (1990a) suggested that this might prove necessary. Sands and New (2002) regarded the Victorian subspecies, *A. chaostola chares* (Waterhouse 1933), as having no national conservation significance. Couchman and Couchman (1977) considered the Tasmanian subspecies *A. chaostola leucophaea* (Couchman, 1946) rare, and it is listed as endangered under the *Tasmanian Threatened Species Protection Act* 1995.

The principal aims of the present study were to survey for the presence of *A. chaostola* in potentially suitable areas of Heathy Woodland, its preferred habitat, in central Gippsland, and to investigate the response of *A. chaostola* to fire. Recommendations then can be made for the most appropriate control burning management regimes in Heathy Woodland necessary to maintain habitat suitable to encourage the butterfly's persistence.

### Biology

The genus *Antipodia*, as currently recognised, contains three species (Braby 2000). They are separated from nearby genera by a number



Fig. 1. The Heath Sand-skipper *Antipodia chaostola*. Photo: Ross Field.

of distinctive characteristics. One is their larval habit of occupying and pupating in a head downward position within downward opening shelters on their food plant, Saw-sedge *Gahnia* spp. (Braby 2000). Three shelters are normally constructed by each larva as it grows (Quick 1991). Other species assigned to close genera (e.g. *Hesperilla* and *Motasingha*) shelter and pupate in an upright position. Another unusual feature of *A. chaostola* is its two-year life cycle, a feature it shares with other members of the genus but with no other Australian skippers (Braby 2000). The larval stage lasts up to 20 months or more (Braby 2000). Atkins (1984) reported that *A. chaostola* flies each year, and that there are no discernible constant differences between specimens in odd and even years. Their pale, striped head and bright red prothorax easily distinguish larvae of *A. chaostola* (Atkins 1984).

Adult butterflies can be found flying during October and November, and occasional specimens have been recorded in September and December. They are generally active only when the ambient temperature reaches 16°C or above, or the humidity is high (Crosby 1990a). Between 10 am and noon appears to be the best time of day to see adults; the afternoon is generally less profitable (D Crosby pers. comm.

1998). Activity is reduced when conditions are windy or overcast (D Crosby pers. comm. 1998). Individuals will often sun themselves on leaves in sheltered spots. Males defend territory from a perch on a prominent twig or leaf to which they return after inspecting or attacking nearby flying insects. These occasionally are other skippers, and often include the Australian Painted Lady *Vanessa kershawi*, or even the large, flower-feeding Jewel Beetle *Stigmodera macularia*, both of which can be common during Spring months. The Heath Sand-skipper feeds on nectar from a range of low bushes or herbs including Common Rice Flower *Pimelea humilis*, Prickly Teatree *Leptospermum continentale*, Heath Teatree *L. myrsinoides*, and Milkmaids *Burchardia umbellata*. Males occasionally have been observed flying near ridgetops (Atkins 1984). Females are less active than males and flit close to the ground in the sun, or sit and sun on leaves, especially those of the larval food plant preferred in eastern Victoria, Thatch Saw-sedge *G. radula*. It is probable that females, especially gravid individuals, fly many kilometres in search of suitable food plants in new patches of appropriate habitat (N Quick pers. comm. 1998). Soon after emergence, both sexes seek 'nuptial' flight-areas that are shel-

tered, warm and humid. These areas are generally in physical depressions. Soon after pairing, females depart to seek nectar and oviposit in the much wider breeding habitat or 'dispersal area'. Males on the other hand, appear to remain largely within the flight area. Together, the flight area and dispersal area constitute a 'habitat cell'. The two areas may adjoin or be in close proximity but, in general, the breeding (dispersal) area appears to extend 50-200 m or more outside the very sheltered and humid flight areas (Quick 1991).

The Heath Sand-skipper is a temperate climate species known from a very low number of sites in the Blue Mountains, NSW, and eastern coastal areas of Tasmania, and in Victoria. It is rare throughout its range and much of its habitat has been cleared (Atkins 1984; McCubbin 1971; Neyland and Bell 2000). The subspecies *chares* is found only in Victoria and is currently known from the Grampians region of western Victoria, the Anglesea area, locations immediately to the east of Melbourne, Central Gippsland and near Nowa Nowa in East Gippsland. The Blue Mountains (New South Wales) locations of the Heath Sand-skipper, from Katoomba to Lithgow, are up to 1000 m in altitude (Atkins 1984), whereas most locations in Victoria and Tasmania are near sea level or in the foothills below 300 m. An exception is the summit of Mt William in the Grampians, at 1167 m, in an atypical microhabitat where it exploits atypical food plants - Red-fruit Saw-sedge *Gahnia sieberiana* and Slender Saw-sedge *G. microstachya* (Common and Waterhouse, 1972).

Other than at the Grampians, most records from Victoria up until the 1950s were from locations close to Melbourne (e.g. Beaconsfield, Frankston, Heathmont, Macclesfield, Mt. Evelyn, Ringwood, Wandin), or in Central Gippsland (e.g. Moe, Yallourn, Yinnar), where the habitat has been largely alienated and the Heath Sand-skipper probably now has been eliminated (McCubbin 1971; D Crosby pers. comm. 1998). Very few collections were made in the 1960s. The increase in records during the 1970s, 1980s and early 1990s reflects the discovery of new localities, such as 10 km southwest of Nowa Nowa, Anglesea and at sites in the foothills of Central Gippsland (e.g. Labertouche, Moondarra Reservoir area, Sweetwater Creek area about 17 km north of Yarragon, and Tynong North). The Nowa Nowa site appears to

be another location that has suffered destruction and probable elimination of the skipper (D Crosby pers. comm. 1998).

For successful management of the Heath Sand-skipper and its habitat, it is important for land managers to know precisely where it occurs. Accurate knowledge of colony locations, including flight and dispersal areas, would provide for effective fire management as well as for repeated monitoring of the skipper. Overcollecting of rare species of butterflies was once considered a major threat, but lack of appropriate land management considerations is now regarded as more important.

### Habitat requirements

The Heath Sand-skipper is generally very scarce and local, apparently dependent on very specialised habitats near sheltered headwaters and marshlands within stringybark and peppermint Dry Sclerophyll (Heathy) Woodlands and Sandy Heaths (Atkins 1984). This habitat typically is at the head of a shallow gully, in gently undulating areas or sloping ground, especially on north-facing slopes that are wet to very wet in winter. Because of the high leach rate, soils are invariably impoverished, characteristically supporting scattered but stunted stringybarks with thickets of *Leptospermum* spp. and *Hakea* spp., and a heavy groundcover of various sedges and grasses. During the skipper's brief flying-season (October and November), these conditions provide shelter from winds and form suntraps in which humidity levels can be high (Quick 1990). Adult butterflies favour these small, warm, open patches.

Larvae in Victoria feed principally on small plants of *Gahnia radula* growing in sheltered, warm, damp locations in Heathy Woodland on poorly drained but sunny sites. Food plants selected for oviposition by female butterflies are generally healthy but dwarfed, probably because of slow growth caused by soil compaction. Slow growing, depauperate plants growing on highly leached, impoverished soils may be chosen to avoid the necessity of continually reconstructing the shelter as the *Gahnia* leaf blades grow. Although the food plant is very widespread in Victoria, only select specimens growing in very specialised microhabitats may be suitable to support larvae to adulthood. This situation may have contributed to a natural rarity of the species. If there is little opportunity for larvae to move from one plant to another,

they each may be confined to only one small and slow growing host plant. If larvae can slow their feeding and extend it over a two-year period, then this may allow for new plant growth to replace leaves and keep pace with the larval consumption rate. C McCubbin (pers. comm. 1998) has proposed that the Heath Sand-skipper breeds in margins of swampy areas, where other *Gahnia* feeding Lepidoptera do not occur, suggesting interspecific competition and subsequent niche separation.

### The study area

Within Central Gippsland, areas surveyed for butterflies were generally in the foothills of the Great Dividing Range below 200 m altitude with an average annual rainfall of approximately 1000 mm. These areas are encompassed within the catchments of the Latrobe River, Tanjil River and Tyers River. In addition, other areas assessed and searched for butterflies were in similar foothill country in the catchments of the Bunyip and Tarago Rivers, in the adjacent Central Highlands region, and to the south of the Princes Highway. Gullan *et al.* (1984) described twenty vegetation communities for their South and Central Gippsland study area, but noted that large areas of native vegetation were cleared for pasture and pine plantations since settlement.

### Methods

The Heath Sand-skipper food plant in Central Gippsland, *Gahnia radula* is very abundant and widespread. As larval shelters are very well concealed toward the base of these plants, and larval chew marks down the sides of leaves are very difficult to see, it was considered more practical to focus primarily on searches for adult butterflies rather than larvae. Based on previous records of the dates of capture of the Heath Sand-skipper in Gippsland, the present survey of adult butterflies was confined to the months of October and November 1998. Searches for larvae, with an experienced lepidopterist (Dr R Field), in the Sweetwater Creek area in April 1999, failed to locate any Heath Sand-skipper larvae, and only two specimens of another *Gahnia*-feeding skipper (probably Varied Sedge-skipper *Hesperilla donmya*) were found. As adults show greatest activity during the two hours before noon, butterfly searches included this time period. As the butterflies require a minimum ambient temperature of

16–20°C and high humidity to become active, searches within flight areas occurred particularly during warm weather.

Information on altitude, aspect, slope and vegetation preferred by the Heath Sand-skipper was obtained by visiting sites where the butterfly previously had been collected. Colour aerial photographs, 1:25 000 topographic maps and ecological vegetation class (EVC) maps, where available, were used in an effort to pinpoint further areas of Heathy Woodland that were potentially suitable habitat for the skipper. These locations were then visited to determine whether the vegetation and other environmental conditions matched those of known Heath Sand-skipper sites and to search for adult butterflies.

At sites where a specimen was located, a GPS reading of latitude and longitude, notes on weather conditions, time of day, and a structural and floristic vegetation assessment were made. Voucher specimens of the Heath Sand-skipper were pinned and lodged with the Department of Entomology, Museum Victoria.

### Results

The Heath Sand-skipper was captured at five sites during this survey. Figure 2 shows all recorded *A. chaostola* sites in Central Gippsland, at three of which (sites 1, 4 and 5) specimens were captured during the current survey. Sites 2 and 3, a large expanse of suitable habitat along Hard Up Haul Track in the Sweetwater Creek area, are the only new locations found during the present survey. Sites 2 and 3 are approximately 1 km apart.

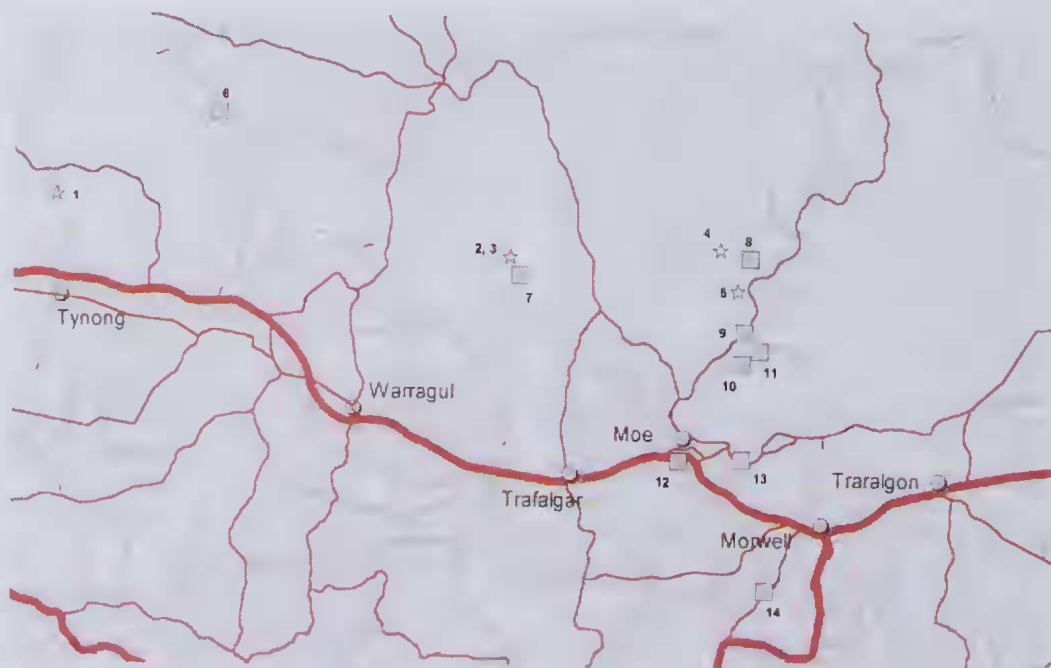
The locations and some details of each site are provided below.

**1. Location:** Tynong North Road, at junction with Ferres Track, Tynong North, Bunyip State Park, 7 km north of Princes Freeway (Fig. 3).

**GPS:** 38°00.17'S; 145°37.01'E. **Map grid reference:** 784928 (1: 25 000 Garfield North). **Map altitude:** 150 m. **Aspect:** W. **Date:** 30 October 1998.

**Canopy:** Mealy Stringybark *Eucalyptus cephalocarpa*, Broad-leaved Peppermint *E. dives*. 8–10 m high, 20–30% cover.

**Midstorey:** Bushy Needlewood *Hakea decurrens*, Furze *Hakea H. ulicina*, Hairpin Banksia *Banksia spinulosa*, Silver Banksia *B. marginata*, *Leptospermum continentale*, *L. myrsinoides*, Spike Wattle *Acacia oxycedrus*,



**Fig. 2.** Map of Central Gippsland showing known sites of *A. chaostola*. Lines indicate major and minor roads. Stars (sites 1-5) indicate locations at which the species was found during the present survey. The species previously has been recorded at all sites except sites 2 and 3. Sites: 1 - Tynong North Road, Tynong North, Bunyip State Park; 2 - Hard Up Haul Track, 1.5 km east of Beards Road, Harold Creek forest block, Latrobe State Forest; 3 - Hard Up Haul Track, 0.5 km east of Beards Road, Harold Creek forest block, Latrobe State Forest; 4 - Seninis Track, Moondarra State Park (MSP); 5 - Tyers River crossing, MSP; 6 - Labertouche area; 7 - Sweetwater Creek Nature Conservation Reserve; 8 - Seninis Track, MSP; 9 - Junction of Walhalla and Moondarra Reservoir Roads, MSP; 10 - Anderson Track, MSP; 11 - Early Road, via Moondarra Reservoir Road; 12 - Moe; 13 - Yallourn; 14 - Yinnar.

Sweet Wattle *A. suaveolens*, Spreading Wattle *A. genistifolia*. To 3 m high, up to 40% cover.

**Groundcover:** *G. radula*, Wiry Spear Grass *Austrostephanos muelleri*, Wiry Bauera *Bauera rubioides*, Rosy Baeckea *Euryomyrtus ramosissima*, Common Heath *Epacris impressa*, Tall Sundew *Drosera peltata*, Pouched Coral-fern *Gleichenia dicarpa*, Grass Triggerplant *Stylidium graminifolium*, *Pimelea humilis*, Matrush *Lomandra* sp. Up to 1 m high, 100% cover.

**Specimen details:** One female taken 12.00 pm; 25°C, clear, medium north wind.

2. **Location:** Hard Up Haul Track, 1.5 km east of Beards Road, Harold Creek forest block, Latrobe State Forest, 21 km north of Yarragon.

**GPS:** 38°00.98'S; 146°05.07'E. **Map grid reference:** 195918 (1: 25 000 Springsure Hill).

**Map altitude:** 230 m. **Aspect:** NW. **Date:** 6 November 1998.

**Canopy:** Yertchuck *Eucalyptus consideniana*. To 10 m high, 10% cover.

**Midstorey:** Occasional Narrow-leaf Wattle

*Acacia mucronata*, *H. decurrens*, *B. spinulosa*.

**Groundcover:** *G. radula*, *L. continentale*, *L. myrsinoides*, *A. muelleri*, Swamp Selaginella *Selaginella uliginosa*, *Burchardia umbellata*. 100% cover.

**Specimen details:** One female and one male taken 3.00pm; 22°C, clear, light south breeze; four other specimens seen nearby; *Trapezites phigalia* common.

16 November 1998: one male taken 11.00 am; 20°C, overcast, no breeze; *T. phigalia* common.

3. **Location:** Hard Up Haul Track, 0.5 km east of Beards Road, Harold Creek forest block, Latrobe State Forest, 21 km north of Yarragon (Fig. 4).

**GPS:** 38°01.14'S; 146°04.63'E. **Map grid reference:** 189916 (1:25 000 Springsure Hill).

**Map altitude:** 240 m. **Aspect:** N. **Date:** 25 October 1998.

**Canopy:** Messmate Stringybark *Eucalyptus obliqua*. 5 m high, 10% cover.

**Midstorey:** *L. continentale*, *L. myrsinoides*,



Fig. 3. Heath Sand-skipper habitat at site 1 (Tynong North Road, Tynong North, Bunyip State Park), 30 October 1998.

*B. marginata*, *B. spinulosa*, *H. decurrens*, *A. mucronata*, *G. dicarpa*, Pink Swamp Heath *Sprengelia incarnata*.

**Groundcover:** *G. radula*, *A. muelleri*, *P. humilis*, *Gahnia sieberiana*, *S. uliginosa*, *B. umbellata*. 100% cover.

**Specimen details:** Two males taken 1.30pm and 2.00pm; 25°C, clear, very windy; one other specimens seen nearby.

4. **Location:** Seninis Track, 3 km west of Walhalla Road, Moondarra State Park, 18 km north of Moe (Fig. 5).

**GPS:** 38°00.89'S; 146°19.09'E. **Map grid reference:** 402919 (1:25 000 Moondarra). **Map altitude:** 240 m. **Aspect:** N. **Date:** 3 November 1998.

**Canopy:** Narrow-leaved Peppermint *Eucalyptus radiata*. 3-10 m high, 10% cover.

**Midstorey:** *L. continentale*, *L. myrsinoides*, *H. decurrens*, *H. ulicina*, *B. spinulosa*, *Burgan Kunzea phyllicoides*, *A. mucronata*, *S. incarnata*.

**Groundcover:** *G. radula*, *S. uliginosa*, *G. dicarpa*, *Lomandra* sp., Screw Fern *Lindsaea linearis*, grasses. 100% cover.

**Specimen details:** One male taken 12.30pm; 25°C, clear, light west wind.

5. **Location:** Walhalla Road, 0.5 km south-west of Tyers River crossing, Moondarra State Park, 16 km north north-east of Moe.

**GPS:** 38°02.39'S; 146°19.51'E. **Map grid reference:** 408897 (1: 25000 Moondarra). **Map altitude:** 200 m. **Aspect:** N. **Date:** 31 October 1998.

**Canopy:** *E. obliqua*, *E. consideniana*. 15-20 m high, 20% cover.

**Midstorey:** *L. continentale*, *B. spinulosa*, *K. phyllicoides*.

**Groundcover:** *G. radula*, *P. humilis*, *S. incarnata*, *Lomandra* sp., grasses. 100% cover.

**Specimen details:** One male taken 11.30 am; 25°C, clear, light west wind; two other specimens seen nearby at 11.00 am.

## Discussion

### Habitat preference in Central Gippsland

In Central Gippsland, and in the adjacent Central Highlands region, the Heath Sand-skipper appears to be a habitat specialist, being restricted to areas of Heathy Woodland, an uncommon vegetation community occurring on gentle, north-facing lower slopes. Heathy Woodlands have developed on yellowish gradational soils, sandy at the surface, with a clay or coffee rock



Fig. 4. Heath Sand-skipper habitat at site 3 (Hard Up Haul Track, 0.5 km east of Beards Road, Harold Creek forest block, Latrobe State Forest, 21 km north of Yarragon), 29 February 2008.

impeding layer at some depth, and are thought to be very old and now infertile remnants of an old erosion surface (Land Conservation Council 1991). Soils may be seasonally wet, but generally dry out in summer.

In areas where the skipper was recorded, the tree canopies of the Heathy Woodland consisted of a range of stringybark and peppermint eucalypt species that could grow to a height of 20 m, but generally were stunted and only 5–10 m tall and with a canopy cover of 10–30%. The midstorey generally consisted of a range of low shrubs, including *Leptospermum*, *Acacia*, *Hakea* and *Banksia*, and was most diverse and dense in areas that were long unburnt. Frequent, low intensity fires favour species that resprout from rhizomes such as *Gahnia radula* and *Austrostipa muelleri*, which provided close to 100% ground cover at the Heath Sand-skipper sites. Other ground layer plants included *Bauera*, *Gleichenia*, *Lomandra*, *Pimelea*, *Selaginella*, *Sprengelia* and *Burchardia*.

A band of Heathy Woodland straddles the lower foothills to the south of the Great Dividing Range, at altitudes generally below 300 m, from the Cardinia-Gembrook area eastwards

to north of Moe. Representative examples are reserved within Bunyip State Park, Moondarra State Park and Sweetwater Creek Nature Conservation Reserve. As the Sclerophyll (Heathy) Woodland habitat is rare, Gullan *et al.* (1984) designated the following locations as sites of botanical significance: the Old Tanjil-Tyers River (Moondarra) region (state significance), the catchment of the Latrobe River south of Stoll Road (in the south-east section of the Latrobe State Forest e.g. Sweetwater Creek Nature Conservation Reserve) and the Bull Beef Creek catchment (in the Bull Beef Creek Nature Conservation Reserve), north of Old Tanjil, (both of regional significance), and a small area at Seven Mile Creek Road, in the Latrobe State Forest (of local significance).

Numbers of Heath Sand-skippers sighted at one location, on a single day, were very low, ranging from just one individual, at sites 1, 2 (16 November) and 5, to a maximum of six counted at site 2 (6 November). On other occasions during the flight season, at some of these locations, no specimens were sighted. Although specimens in the field are inconspicuous and easily overlooked, it is felt that the low



Fig. 5. Heath Sand-skipper habitat at site 4 (Seninis Track, 3 km west of Walhalla Road, Moondarra State Park, 18 km north of Moe), 29 February 2008, two years after burning during the Moondarra bushfire.

numbers reflect small population size. At some sites, including where the Heath Sand-skipper was observed, another skipper, Heath Ochre butterfly *Trapezites phigalia* of similar size, colour and habits, appeared relatively abundant in the same location. At previously recorded sites, where populations of the Heath Sand-skipper have been regarded as strong, but where none was found during the current survey (e.g. in the Sweetwater Creek Nature Conservation Reserve, and along Anderson Track in the Moondarra State Park) it is possible that the species persisted but avoided detection. If so, then the populations must be small. Further searches in these areas to establish the status of the species would be worthwhile.

#### *Management considerations*

Given the absence of fire in Heathy Woodland, vegetation successional change would probably never result in a true forest association. The poor, often waterlogged and compacted soils of this habitat may prevent the development of forest to some extent, such that some open patches of heath remain, a condition apparently necessary for the persistence of the Heath Sand-

skipper. Nevertheless, fire regimes play an important role in determining the species composition and abundance in this Heathy Woodland community. Fires, particularly the relatively frequent fuel reduction burns, inhibit the development of climax vegetation. As the skipper favours early successional stages of vegetation structure, the prevention of mature vegetation may not, *per se*, eliminate it. Elimination of the early stages (larvae and pupae) of the butterfly by fire is the threat. Fire represents the greatest threat to the viability of colonies due to their restricted area, the slow rate of breeding and resultant changes in the composition and physical structure of the habitat (Crosby 1990b). Because there are larvae present throughout the year, there is no time when a fire will not result in losses. Maintaining a full range of fire regimes by burning in a mosaic pattern with different patches experiencing a range of fire histories, including unburned areas, would probably assist flora and fauna conservation, both inside and outside biological reserves. As the Heathy Woodland habitat is slow growing, the impact of excessive vegetation growth on butterfly colonies also is

slow. This allows small infrequent burns to achieve the desired effect of clearing excessive growth and fuel accumulation.

The response of the Heath Sand-skipper to fire is poorly understood. After the Sweetwater Creek Nature Conservation Reserve experienced fire in late 1979, it was eight years before the skipper was re-recorded. Allowing for the two-year life cycle, this indicates re-entry six years after the fire, or earlier (Quick 1990). A significant portion of the habitat burned again early in 1987, but this time the butterfly colony began recovery after only four years (Crosby 1990a, b). The Heath Sand-skipper site adjacent to the Walhalla Road in the Moondarra State Park (site 5) was burned during a wildfire in March 1994, and the Seninis Track site (site 4) was control burned in April 1993. Therefore, after four and five years respectively, the butterfly colonies had already re-established, given the assumption that the presence of butterflies implies an established colony. The Tynong North Road site (site 1) was along a cleared line, recently slashed, parallel with the main road, suggesting an opportunistic use of an artificially maintained open, treeless, low heath habitat.

Crosby (1990a) suggested that the Fire Protection Plan for the Sweetwater Creek Nature Conservation Reserve should allow for a five-year burn cycle on some peripheral areas (protection priority 1 zone), and that an 8-12 year program would be acceptable in the remainder of the reserve (priority 4 zone). This would be subject to limitation of the extent of the burns and to assessment of the recovery rate since the last burn. A burn cycle of 5-7 years is probably the minimum frequency capable of maintaining Heath Sand-skippers (N Quick pers. comm. 1998). Burning in a mosaic pattern would be preferable, to allow for recolonisation by butterflies from nearby unburned areas. Females may fly large distances, laying one or few eggs in many different locations, and therefore may move into recently burned areas where there is new *Gahnia* growth (A Atkins pers. comm. 1998). Each female has the potential to lay 35-50 eggs, and up to 60 under exceptional conditions (Quick 1991). Females appear to favour small young plants or regrowth following bushfires for oviposition (Atkins 1984). Fire generally does not eradicate *Gahnia radula* and after fire the plant regenerates well, providing good conditions for the skip-

per. In fact, fire may be important or necessary for new growth of *Gahnia*, and consequently for the persistence of the Heath Sand-skipper. For the New South Wales subspecies of the Heath Sand-skipper *A. chaostola chaostola* (Meyrick, 1888) natural fluctuations in adult numbers occur because of the interactions of fire and parasitoids (Sands and New 2002). The immature stages naturally are attacked heavily by parasitoids. However, soon after bushfires when the food plants have recovered, recolonising adults from unburned areas are temporarily able to increase in abundance due to low densities of the natural enemies, mostly parasitoids. The species subsequently subsides to very low densities, which persist until after further burning and recolonisation.

During this survey, no Heath Sand-skippers were located in the Sweetwater Creek Nature Conservation Reserve (1240 ha), although a colony was found about 2 km north of its northern boundary and about 3.5 km north of previous Heath Sand-skipper records within the reserve (Crosby 1990a). This colony was located in the Latrobe State Forest, along Hard Up Haul Track, in the large Harold Creek forest block (1890 ha), most of which has been provisionally recommended for softwood production (Land Conservation Council 1982). There is a large expanse of Heathy Woodland (at least 400 ha) in this forest block (Land Conservation Council 1982), whereas the area of similar habitat, preferred by the Heath Sand-skipper, is relatively small within the Sweetwater Creek Nature Conservation Reserve (Department of Primary Industries 2008). Only two small areas within the Harold Creek forest block have been designated Special Protection Zones by the Department of Sustainability and Environment (2008), a forest management zone where timber harvesting is excluded. However, neither of these zones encompasses the main areas of Heathy Woodland habitat, particularly those south of Hard Up Haul Track, towards Stoll Road and south of Stoll Road towards the north boundary of the Sweetwater Creek Nature Conservation Reserve. Except for these small Special Protection Zones, the entire Harold Creek forest block, as well as a strip of land roughly 1 km in width between the forest block and the Latrobe River, is included within the General Management Zone, a zone where sustainable timber harvesting is a major use (VicForests 2008).

The Heath Sand-skipper has been recorded from six areas within the Moondarra State Park. Before creation of the park, three, perhaps four of these may already have disappeared due to various causes (Quick 1991). The Early Road colony (site 2a of Crosby 1990b), a once-strong population, is believed to have been lost because of its proximity to a plantation of *Pinus radiata* (Quick 1991). The combined effects of reduced ground-water availability, dust and pine-pollen contamination of the *Gahnia* foliage, and overshadowing, may have led to the decline. Before the 2006 Moondarra bushfire the vegetation at this site had been long unburned as it was completely enclosed by pines, and therefore became very dense and tall, probably contributing to its unacceptability for the Heath Sand-skipper. The colony at site 2 of Crosby (1990b), at the junction of Walhalla and Moondarra Reservoir Roads, may have disappeared because the location had been regularly slashed, and was degraded by the construction of road cuttings and embankments, as well as the laying of an underground water pipeline in the early 1980s. During the present survey it was discovered that colonies had persisted at the Seninis Track and Tyers River sites (sites 3 and 6 together, and site 4 respectively of Crosby 1990b) but after extensive searching no specimens were observed at the Anderson Track location (Crosby's site 1). Further searches at this site would be worthwhile in order to establish the current status of the skipper. The proposed nine year fuel reduction burn cycle, and staggering the burning of patches of the habitat in a mosaic pattern (James 1991) in the Moondarra State Park is probably suitable to provide a constant availability of appropriate habitat for the Heath Sand-skipper.

At all three localities at which the Heath Sand-skipper was found during this study (in 1998), strong colonies were found at sites 1, 3 and 5 in the flight season of spring 2005, and at site 1 in spring 2006 (R Field pers. comm. 2008). A revisit to these sites in early 2008 found that only the Moondarra State Park had experienced fire since the 1998 survey. This was the Moondarra bushfire of January 2006 that burned an area of over 15 000 ha. It would be valuable to resurvey the Moondarra sites for skippers during successive future butterfly flight seasons (October–November), to discover if and when the species will re-establish post fire.

## Conclusion

In Central Gippsland, the Heath Sand-skipper may persist at only three separate localities, viz. Tynong North, the Sweetwater Creek area north of Yarragon, and the Moondarra State Park. The species appears to be lost from other recorded localities within the region, as well as from some sites in the Moondarra State Park.

During the 1998 survey, no sightings were made in the Sweetwater Creek Nature Conservation Reserve, although the skipper was found in an extensive patch of the preferred Heathy Woodland vegetation community in the Harold Creek forest block, immediately north of the Reserve. As significant suitable habitat for this butterfly occurs mostly outside the Reserve, the management of these non-reserved areas needs to be assessed for successful conservation of the butterfly.

Using a 9–12 year fuel reduction burn cycle, and staggering the burning of patches of the habitat in a mosaic pattern, are probably suitable strategies to provide a constant availability of appropriate habitat for *A. chaostola*.

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## One Hundred and One Years Ago

### Lepidoptera of the Victorian Alps; two new butterflies for Victoria

BY G. LYELL, F.E.S., Gisborne

On the 10th February we drove to Mt. Hotham, six miles distant, and the highest point on the Omeo road. Here, on the extreme summit (6,100 feet) we found another butterfly new to Victoria in *Xenica orichora*. This was named by Meyrick from Mt. Kosciusko in 1885, and has since been several times taken in the same spot, but not elsewhere. Anderson and Spry, in "Victorian Butterflies", mention it as a possible Victorian species likely to be taken near Bright—an opinion now verified. This species was fairly abundant, though not in the best condition, and the preponderance of females showed we were rather late for it.

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